tent than we ever dreamed in our most abject moods. And we should feel that it must indeed be a colorless world for them.

RUFUS E. MARSDEN.

MENTAL IMAGERY.[1]

Dr. Slaughter's method was to 'ascertain as nearly as possible the exact behavior of the image during a certain interval of time which after trial was fixed at ten seconds.' Figures drawn on cards were used as stimuli. The subject was allowed to fix his gaze on the figure for an indefinite time. At a signal he closed his eyes. Five seconds later he was told by another signal to watch his imagery carefully and to remember the behavior of it, and, after ten seconds of such introspection, he recorded his results. For stimuli designed to evoke visual imagery various figures were used, such as a black square on a white card, with other geometrical forms, playing cards and printed letters. From these tests and from reports of blindfolded chess players he infers that the inner or imagery visual field is contracted, that only a small portion of what was really seen can be reproduced at any one moment in visual imagery. For the purpose of arousing motor images the subject was (supposedly — there is no definite statement) shown cards with, *e. g.*, a picture of a pendulum or of a circle with a ball on the edge. He was told to get a motor image of this, *i. e.*, to imagine the pendulum swinging and to imagine the ball as rolling around the circle. It is not clear from the article what he asked his subject to do, whether to visualize motion or, in some part of his body, to motilize (so to speak) the specified motion. His subjects here report an actual eye movement in themselves, but this is not either motor or motion imagery. Auditory images were called for by the presentation of a tuning fork, two tuning forks with a beat, slowly dripping water, quickly dripping water, a waterfall, ticking of a watch and whistling of wind. The dermal, gustatory and olfactory images studied were those of plush, clammy hand, hot water, plunge into cold water, the four tastes, and ammonia and alcohol. He states that in all the tests with the exception of the card series (that is presumably the playing cards) drawn figures were used instead of call words (p. 529). It is difficult for the present writer, who considers himself at least moderately skilled in mentally representing his objective experiences with considerable fidelity to the quality of the original sensation, to conceive how, *e. g.*, a clammy hand could be drawn on a card

[1] 'A Preliminary Study of the Behavior of Mental Images,' J. W. Slaughter, *Amer. Jour. Psych.*, October, 1902, pp. 526–549.

without the words 'clammy' or 'this hand is clammy' either printed or called; to say nothing of presenting as an auditory stimulus the line drawing of a waterfall or of two tuning forks with beats! The method used for the study of visual images consisted in presenting something to the actual vision of the subject for purposes of making test conditions and of having them as simple and definite as possible. These were then voluntarily recalled as visual images and their behavior described. The auditory images (as we learn from p. 541) were evoked by call words, but we must object here that if this is the case the study of his subjects' auditory images is not analogous to that of their visual images. The parallel to presenting real sights to the eye is presenting real sounds to the ear; and, in the case of motor and motion images, is the presentation of real motion, *i. e.*, putting his subjects in a swing or on a rocking horse or giving them a good shaking by the shoulders for motion imagery; for motor imagery getting them to do some unusual thing with their arms or legs; and, for olfactory, gustatory, and other images, giving them real sensations belonging to these different sense qualities and asking them on some subsequent occasion if they have observed any mental resuscitation of the originals. I say on some subsequent occasion, because the quality of some of the last-mentioned sensations is, in my own case at least, likely to remain as an after image or memory image (motor, *e. g.*, the rocking of a vessel experienced by one sometimes after disembarking, which has the quality of an after image: objectivity, non-subjective determination, etc.). If this research had been consistently carried out even with call words as stimuli, it would, to be strictly consistent, have thrown out the study of auditory images entirely.

The doubtful value of Dr. Slaughter's experiments is plainly shown in his discussion of his subjects' auditory introspections, *e. g.*, he says that his subject St. 'really has better auditory images than K. and is strongly motor while K. is strongly visual'; and 'when the object stands out complete except for the sound, and the whole situation is arranged so as to point to it, it may seem present as a matter of course whether it actually appears or not, and may seem as clearly distinguishable as any of the other qualities. It is similar to the case of the blind spot in the field of vision.' I think Dr. Slaughter has been misled here by a false analogy. A sense quality is a definite complete and always distinguishable mental phenomenon, and a subject if sufficiently trained in introspection can always say whether he has it or has it not, or feels doubtful about it. It is beyond the province of any one else to tell him that he has it not, when he says he has it.

If therefore the subjects of Dr. Slaughter say they had auditory imagery, he can hardly presume to say that they did not. He says he knows his subject St. had no auditory imagery because St. said he had the other kinds, *i. e.*, the presence of visual imagery is sufficient proof that the other kind did not exist, in spite of the statement of the subject that it did.

To examine in detail some of the verbal reports of the introspection of the subjects, let us take those concerning auditory imagery. After the call word (?) 'tuning fork,' subject St. "Felt tension in tongue but could not really get sound. Had sort of humming located in mouth fairly continuous. No visual image of fork. No kind of outside setting." The only words here that can, by any twist, be made to describe auditory imagery are the continuous humming; but he puts it in his mouth! The only way I can mouth the conception of humming is by means of motor imagery. True auditory humming is imaged in terms of pure sound, and as I wrote these words I mentally heard a boys' glee club humming a part of a song. There is evidently no clear statement on the part of St. that he has any auditory imagery at all, and yet St. is the subject who 'really has much better auditory images than K'! Let us follow St. through several other experiments. In 'Two tuning forks with beats' St. says, "Visual image of two forks. Oscillation of attention between forks that really seemed external and humming in the head. Beats were only rhythm put in by emphasis in humming. Visual image had no setting, seemed just in front in air. It fluctuated considerably." There may have been real auditory imagery here. To 'Slowly dripping water' subject St. says, "No visual imagery. Felt distinct movement in throat." This is real objectified sensation, and not imagery of any kind. "Rhythm intervals about a second long. Word 'drop' was repeated with the rhythm." No description of auditory imagery here! When he says 'drop' was repeated, he fails to tell us how. It might have been auditory; but if so, why did not he say so? It might have been motor, but he does not say that. For 'Quickly dripping water' he says: "Chief part of whole complex was movement in throat." To 'Waterfall' he says: "Visual image of waterfall and water falling over. Movement in throat muscles." And so on. No claim to have had auditory imagery either of ticking of watch or of whistling of wind, unless his statement about the wind that it was 'of whistling around corner of house but no visualization of house' may be taken as a description of auditory imagery. On the other hand, subject K., the inferior aurilizer, disclaims throat

muscle sensations and visualizations in several instances and uses expressions descriptive of real auditory imagery such as 'got sound image,' 'got sound first,' 'sound image very distinct,' 'auditory fairly constant,' 'sound image first,' 'strong wheezy whistle,' etc., though he is constantly describing visual motor and verbal concomitants. Are these concomitants what Dr. Slaughter means by the 'behavior' of the auditory image? In that case, if a pure unaccompanied auditory image existed in his subjects, even for a moment, they would not have any behavior, and so would not come within the scope of his article. It seems, however, that this study of mental images should as stated (p. 526) be 'a study of particular images, if not in their relations, at least *in situ*,' but in the 21 introspections offered us as studies of auditory images, there seem to be only 11 real examples. These, to be sure, are studied *in situ*, or rather all except a few words of the reports are a description of the *situs* and not of the image itself.

Dr. Slaughter remarks on the auditory part of his study that "we are dealing with a vastly more complicated set of conditions than in any of the experiments [visual, motor, motion] previously considered. Images of a visual character are possessed of a certain degree of independence, and the conditions of their maintenance are chiefly, for introspection at least, to be found within themselves. Again, motor images, when taken in isolation, merely require a partial repetition of the original movement or impulse to that movement. But apparently in the case of auditory images, the conditions both of obtaining and holding them have to be brought in from outside. In other words, the study of auditory images is chiefly one of association, both of ideas and sense elements" (p. 543). To these remarks I should like to object: (1) that an auditory image is a psychical phenomena as simple and elemental as is the sensation of a real tone produced by a tuning fork, and (2) that its behavior is not its concomitants. These may or may not influence its maintenance in consciousness, but can not affect its character. Again, let me urge that if motor images, 'when taken in isolation' (where's the behavior gone?), require (for their maintenance, supposedly) a partial repetition of the original movement, then during the time occupied by their partial repetition, the image being comparatively so faint, can not be detected in the mental complex; and that it is tautologous to say that otherwise they require, in order to be maintained, the impulse to that movement, because the impulse differs from the image itself only in the added element of volition.

As to the possibility of subjecting mental images to experimental conditions in the way Dr. Slaughter attempts, I can not but dissent. Had the experiments been carried out for senses other than sight in a manner analogous to that for visual images, he would have had for instance to present a clammy hand to his subjects, let them hold it for some time, wait five seconds, think hard for ten more, and then ver bally report their imagery. The results would have been one of three. Subjects would have felt clammy hand, *i. e.*, the imagined touch of it on their own palms or knuckles, as the case may be; or would not have felt it, or they would not have known whether they felt it or not. Any one of these is a direct simple answer, and any psychologist ought to be available as a subject for such research.

I should like to defend my own method as explained in my monograph, and to say that had it been used by him he would probably have found some others of the ten types mentioned by me. What I reported was what I mentally saw, heard, touched, felt, tasted and smelt in various qualities (all imagined, however). Dr. Slaughter says of my observations of my own imagery, 'The faultiness of the method is evident after a direct examination of the images.' I do not know whether he means by this (1) that an examination of the types of images I reported shows that my method of observing them was faulty, that the lack of experimental conditions surrounding the introspections was at fault, or (2) that my method of using these results was faulty (wherein I would with all humility agree with him). If it was the first, I can only say that having frequently caught myself paying close attention to the various imagery concomitant with silent reading, I allowed the reading to lapse, as it were, and entertained the fleeting images uninterruptedly, much as one reading at a window might lay aside his book and look out at a passing military procession. This I would continue for an average of seven and a half minutes, writing down any word that came into my head, that seemed to describe the image then occupying the foreground of my mental content, and ignoring the other images until they came to the fore. I wrote down words also that did not describe images but were part of the imagery. These were classed as verbal imagery (largely auditory).

The records show that, while I made no effort to detain any one image, the average life of any individual one was 8.86 seconds, or very near the time (10 seconds) which he found by trial to be the best. The real issue is whether the method of trying to think in terms of one sense or another according to stimuli presented by an experimenter is better than the method of passively observing the constitution of the

stream of thought. I grant that the attempt to follow the lead of the experimentally administered and therefore controllable stimulus is more scientific in a narrow sense, but I doubt that any results can come from experiments of this nature, because his subject St.'s failure to get the desiderated auditory imagery in nearly 50 per cent. of the instances cited shows only that he did not get it that time and not that he could not mentally image a sound. It was probably scared away by the unnatural environment of the experiment. There is no proof of course that St. is not able to have auditory imagery. In fact he may be, as Dr. Slaughter says he is, a much better aurilizer than K. Just here, however, he let K. get ahead of him. It seems anomalous that one should offer as a contribution to the study of auditory imagery the statement that in half the cases there was none. And I should like to protest against this experimental method being substituted for mine with the unqualified remark that mine is faulty. I certainly collected specimens of the species of phenomenon I was studying.

On the whole, Dr. Slaughter's paper seems to me to be an example of not a few that have appeared of late in which the conditions of the experiment are not clearly described; and in the statement of the results the language is not clear, and gives the impression that there are more words than ideas behind them. For instance, in a paragraph on the direction of images he seems to be talking about visual images only, and, if so, it would have been better to say so; and the paragraph is so obscurely worded as to be almost unintelligible. When in the conclusion he says that 'the factors which keep visual images in clear consciousness are their own internal organization combined closely with motor elements,' what can be intended by the 'internal organization' of a visual image other than the image itself; and this is equivalent to saying that the factors that keep a visual image clear are the image and its motor elements; but it is hard to conceive what the motor elements of a visual element of consciousness may be. When he says 'auditory images appear only in connection with an organized associative situation,' what do these three words mean but images of other sense qualities? And if he means to say that auditory images appear only in connection with other images, he says what is not by any means proved; and he helps us not at all, for he does not tell us the nature of that connection. He can not make this statement as a conclusion from his experiments, as he has shown that some of his so-called auditory images were not auditory, but only concomitants, only an 'organized associative situation' mostly motor. When he says that 'images from other sense departments also require such a situa-

tion which is in most cases all that appears,' he seems to me to be guilty of a genuine Irish bull! That there is any doubt of the existence of images of other sense departments than visual, auditory and motor, I cannot accept for a moment. When Dr. Slaughter says that 'the real existence of these images is doubtful,' I understand him to mean their existence in other minds as well as in those of his subjects. He intimates as much when he says that 'our subjects failed to manifest such an elaborate equipment' (as the tactile, gustatory, olfactory, thermal, pain and organic imagery mentioned in my monograph), apparently throwing discredit on the truthfulness of my report of my own images. He says: 'One general question bearing upon the work' is 'whether the images obtained under introspective conditions are the same as the normal images of every-day life.' I can not conceive that the normal images can be studied in any other way save in 'introspective conditions,' and it is only in moments of voluntary or involuntary introspectiveness that we become aware that there are any 'normal working images' at all. So that there is no question as to the sameness of the images. The vital question is whether in subjecting or in trying to subject the flow of images to the control of scientific experiment we may not be changing the nature of these images. I believe that we can not change their sense quality. They remain constant in quality, but the machinery of scientific research may cause them to be obscured or driven below the threshold.

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ON LAUGHTER.[1]

A friend of mine once spoke of Sully's writings as sane, eminently sane, but dry. In this 'Essay on Laughter,' however, the reader is fairly deluged and swamped with lively adjectives and figures of speech. 'Blithely' tumbles merrily after 'sprightly' on every page, and 'floods of merriment' chase wildly the 'rillets of joy' of less significant dimensions. Irrelevances in conversation, we are informed, are among 'the recognized tributaries of the river of laughter,' and over all the imp of laughter shrieks his way with uncontrollable joy. Therefore we may say sane, eminently sane, but not dry.

This beautiful largesse of adjectives has, however, also a woful aspect. In the modern world of commerce a business manager would hardly accept a report spread out over 450 pages, a report which might easily have been compressed within 100 pages. I see no reason why the

[1] James Sully, 'An Essay on Laughter, its Forms, its Causes, its Development and its Value,' Longmans, Green & Co., New York, 1902, pp. 441.